



Techniques Engineering as a Partial Requirement for the Degree of B.Sc. in Medical Instrumentation Techniques Engineering

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Annotation: This project was designed specifically for Alzheimer's patients and serves as a guide for the patient. Through it, one of the patient's caregivers is controlled if the device sends the patient's direct location via text message to the Alzheimer's patient's caregiver.

1.1. Introduction

Definition of Alzheimer's disease

Atrophy of healthy brain cells; which leads to problems in memory, thinking, and behavior and affects the lives of people affected by it. The patient's condition also deteriorates over time, as Alzheimer's disease is not a normal stage of aging; but the probability of developing it increases with age.

Alzheimer's disease is a devastating disease for the nerves. It is one of the most common diseases of aging, representing about 8% of all geriatric psychoses. It is more common among women than men. This disease affects about 5% of young people over the age of 65. The date of the discovery of this disease dates back to the year 1906 by the scientist. Because Lewis Alzheimer's found the cause of this disease, and as for the causes of the disease, it may be due to the factor, aging, and the body's lack of vitamin B12 and folic acid. The symptoms of the disease result from three conditions that begin with memory disturbance, discovering some creativity, then mental decline, until the successful person reaches a stage like infants.

1.2. The cause of the disease

Experts don't know exactly why some people develop the disease at an earlier age than others. A less common cause of early-onset Alzheimer's disease is mutations in one of three genes (APP, PSEN1, or PSEN2) that can be passed down to another family member. If a parent or grandparent has early Alzheimer's disease may indicate one of these gene changes.

1.3. Why is it called Alzheimer's?

Alzheimer's disease was first described by German pathologist and psychiatrist Lewis Alzheimer in 1906, and was later named after him.

Causes of Alzheimer's disease

Although the causes of Alzheimer's disease are still unknown, the accumulation of amyloid protein in the brain leads to damage to brain cells, leading to Alzheimer's disease.

- ✓ Genetic and hereditary causes.
- ✓ Getting older.

Factors that increase the risk of heart disease also increase the risk of Alzheimer's disease, including: high blood pressure, hypercholesterolemia, irregular diabetes, and smoking.

- ✓ Lack of mental and physical activity.
- ✓ A diet high in fat and lacking in vegetables and fruits

The idea of the project is a device for Alzheimer's patients that monitors the patient. The person responsible for the patient's condition sends a text message to the chip in the device. Then the device returns the geographical location to the person responsible for the patient's condition.

1.4. Objectives

The primary objective of this project is to design and develop a wearable device that monitors vital signs of Alzheimer's patients. Secondary objectives include integrating features such as GPS tracking and emergency notification to enhance patient safety.

Device Design and Components

2.1. System Architecture

The wearable device is based on Arduino technology, incorporating a variety of modules to fulfill its functionalities.

2.2. Component Overview

Arduino microcontroller: Acts as the main processing unit, collecting and analyzing data from various sensors.

GSM module: Enables communication with caregivers by sending SMS alerts in case of emergencies.

Battery: Provides power to the device, ensuring continuous operation.

Screen: Displays vital signs and status information for both patients and caregivers.

USB module: Facilitates charging and data transfer. Speaker: Provides audio alerts and notifications.

2.3. Integration and Interfacing

The components are integrated seamlessly to ensure efficient operation and user-friendliness.

3.1

A GPS module enables real-time tracking of the patient's location, allowing caregivers to locate them if they wander or get lost.

3.2 Emergency Notification System

In the event of an emergency or if the patient strays beyond predefined boundaries, the device automatically sends alerts to caregivers via SMS.

3.3 User Interface and Controls

The screen provides a simple interface for users to view vital signs and device status, while buttons allow for easy navigation and interaction.

Conclusion

This report presents the development of a wearable device aimed at monitoring Alzheimer's patients and enhancing their safety. By leveraging Arduino-based technology and integrating features such as vital signs monitoring, GPS tracking, and emergency notification, the device offers a comprehensive solution for caregivers. Further research and development are warranted to optimize the device's performance and usability, ultimately improving the quality of life for patients and their families.

Arduino Micro-controller: The Arduino is the brain of the device, responsible for controlling and coordinating its various functions. It's a programmable micro-controller board that runs code to interact with sensors, process data, and manage communication with other modules.

GSM Module: The GSM (Global System for Mobile Communications) module allows the device to communicate with caregivers via the cellular network. It enables the device to send SMS alerts in case of emergencies, providing a reliable means of notification even when outside of Wi-Fi range.

Battery: The battery provides power to the device, allowing it to operate independently of external power sources. It's essential for ensuring continuous monitoring and emergency notification, especially in situations where access to electricity may be limited.

Screen: The screen serves as the user interface, displaying vital signs, device status, and other relevant information. It provides a visual means for both patients and caregivers to monitor the patient's health and interact with the device.

USB Module: The USB module facilitates charging of the device's battery. Each component plays a crucial role in the functionality and usability of the wearable device designed for monitoring Alzheimer's patients, contributing to its effectiveness in enhancing patient safety and well-being.

4.1 System Design and Implementation

Introduction This chapter explains the general design of the proposed system. It summarizes all the fundamental approaches of the attendance system used in the proposed system. In addition, it illustrates block diagrams, flowcharts, and the basic components that utilized in the system. Moreover, the implemented prototype and the algorithms that used are also presented in this chapter. The overall system will be demonstrating and each part of the system will be explained separately.

The interface of the application is consist of three widget. Every Widget serves a special function. Every Widget has it's own settings based on its functionality.

4.2 Algorithm of the proposed system. The system working algorithm is as follow:

1. power up the system with power supply.
2. The user run the application and the measurement appear on the screen.
3. The patient wear the wearable device .
4. The application will notify the Admin who monitor the patient, and the measurements can be read when it appear on the screen as a message, if the admin was oblivious, then the history notification can be read, where each measurement reading is registered in the system.

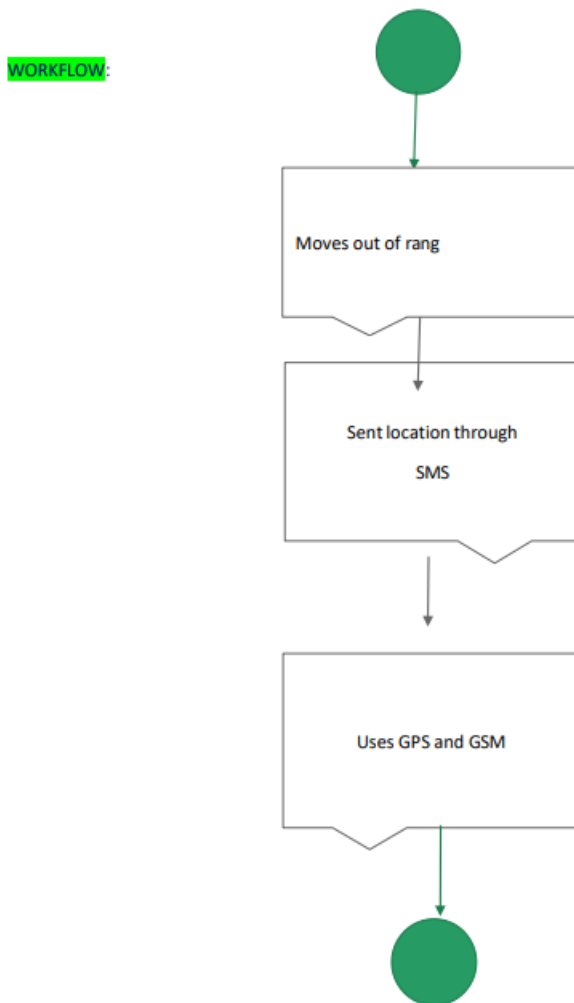
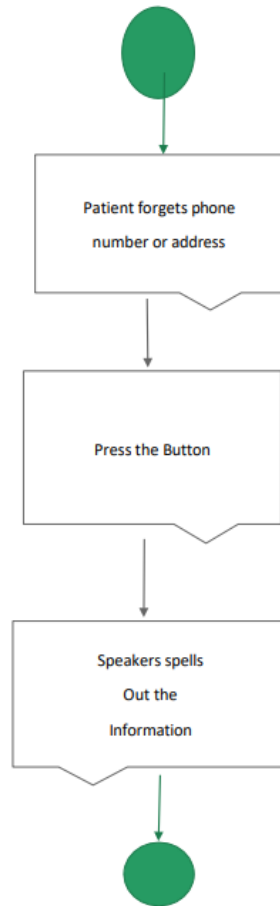


Fig 3-Reminder system flow:



Conclusion:

This project was designed specifically for Alzheimer's patients and serves as a guide for the patient. Through it, one of the patient's caregivers is controlled if the device sends the patient's direct location via text message to the Alzheimer's patient's caregiver.

```

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File Edit Sketch Tools Help
Salal
#include <TinyGPS++.h>
#include <SoftwareSerial.h>
#include <Wire.h>
#include <Adafruit_GFX.h>
#include <Adafruit_SSD1306.h>

#define SCREEN_WIDTH 128
#define SCREEN_HEIGHT 32
#define OLED_RESET -1
#define SCREEN_ADDRESS 0x3C

Adafruit_SSD1306 display(SCREEN_WIDTH, SCREEN_HEIGHT, &Wire, OLED_RESET);
TinyGPSPlus gps;
SoftwareSerial gsmSerial(6, 5);
String message;

void setup()
{
  Serial.begin(9600);
  gsmSerial.begin(9600);
  // gpsSerial.begin(9600);
  pinMode(8, OUTPUT);
  pinMode(9, OUTPUT);
  digitalWrite(8, LOW);
  digitalWrite(9, HIGH);

  if (!display.begin(SSD1306_SWITCHCAPVCC, SCREEN_ADDRESS))

```

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```

Salal
{
  Serial.println(F("SSD1306 allocation failed"));
  for (;;)
  }

gsmSerial.println("AT+CMGF=1");
gsmSerial.println("AT+CNMT=1,2,0,0,0");
delay(1000);

}

void sendLink() {
gsmSerial.println("AT+CMGS=\"+9647729391283\"");
delay(1000);
char link[100];
char lat_str[13];
char lng_str[13];
dtostrf(gps.location.lat(), 10, 6, lat_str);
dtostrf(gps.location.lng(), 10, 6, lng_str);
sprintf(link, "https://www.google.com/maps/search/?api=1&query=%s,%s", lat_str, lng_str);
char* space_pos = strstr(link, " ");
while (space_pos != NULL) {
  char* dest = space_pos;
  char* src = space_pos + 1;
  while (*src) {
    *dest++ = *src++;
  }
}
}

```

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```

Salal
  *dest = '\0';
  space_pos = strstr(link, " ");
}
gsmSerial.print(link);
gsmSerial.write(26);
}
void loop()
{
while (Serial.available())
{
  gps.encode(Serial.read());
}
if (gps.location.isUpdated()) {
  display.clearDisplay();
  display.setTextSize(1.5);
  display.setTextColor(SSD1306_WHITE);
  display.setCursor(0, 0);
  display.print(F("Latitude= "));
  display.display();
  display.println(gps.location.lat(), 6);
  display.display();
  display.print("Longitude= ");
  display.display();
  display.println(gps.location.lng(), 6);
  display.display();
  delay(1000);
}

while (gsmSerial.available()) {
  message=gsmSerial.readString();
  Serial.println(message);
  if (message.indexOf("SOS")>=0){
    sendLink();
  }
}
}
}

```

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